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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,627	04/09/2004	Carlos Angulo Barrios	1153.087US1	8932
21186	7590	07/25/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			PAK, SUNG H	
			ART UNIT	PAPER NUMBER
			2874	

DATE MAILED: 07/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/821,627	BARRIOS ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Sung H. Pak	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 4/18/2006.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-24 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.

- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Amendment***

Applicant's amendment filed 4/13/2006 (certificate of mailing date) has been entered.

All pending claims have been carefully reconsidered in view of the amended limitation and the arguments for patentability advanced therein. After a careful reconsideration, however, the ground of claim rejection provided in the previous office action is maintained by the examiner, and all pending claims are finally rejected over the prior art of record. Please refer to Response to Arguments for details.

### ***Response to Arguments***

Applicant's arguments filed 4/13/2006 have been fully considered but they are not persuasive.

Starting on page 6 of the applicant's amendment, it is argued that McCaughan et al. disclose "the use of trenches to focus the electric field in the waveguides" whereas the currently claimed device use "the optically isolating trenches... to confine or focus carriers, not an electric field." (page 6).

The examiner respectfully submits that isolation trenches disclosed in McCaughan et al. are "air-gap" isolation trenches, as stated in the previous office action. Therefore, the trenches inherently provide optical isolation of waveguides '14' and '15' as shown in Fig. 2 of McCaughan et al. Further, the combination of Onischenko in view of McCaughan et al. as discussed in the previous office action would result in a device with structure that would necessarily perform the functional limitation added by the present amendment (i.e. "increase[ing]

carrier concentration in the micro-cavity”). Thus, the claim rejection based on 35 USC 103(a) over Onischenko in view of McCaughan is proper.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 8, 9, 10, 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Paragraph [0026] of the applicant's specification clearly states, “[t]he role of the lateral trenches is essentially for **electrical isolation** and carrier confinement, that is, **keep carriers** injected from the high doped n and p regions from spreading out laterally. In this way, by using the lateral trenches, the drive current (or injected carriers) are efficiently used...” (emphasis added)

Also, paragraph [0041] clearly states, “By using lateral and longitudinal trenches ... **electrical isolation** of the cavity is achieved along all directions leading to injection carrier confinement in the central guiding region, **suppressing the leakage current** due to carrier spreading.” (emphasis added)

Therefore, the “isolating lateral trenches” of the applicant’s disclosure provides “electrical isolation” as described in the originally filed specification and “optically isolating lateral trenches” as currently claimed lack adequate written description within the meaning of 35 USC 112- first paragraph.

Further, the increase in carrier concentration by “isolating trenches” is an inherently electrical phenomenon (as used in the art, the term “charge carrier” is defined as: “in physics a free (mobile, unbound) particle carrying an electric charge. Examples are electrons and ions. In semiconductor physics, the traveling vacancies in the valence-band electron population (holes) are treated as charge carriers.”- see [http://en.wikipedia.org/wiki/Charge\\_carrier](http://en.wikipedia.org/wiki/Charge_carrier)). As such, “optical isolating lateral trenches... to increase carrier concentration...” as claimed in the present application lacks adequate written description within the meaning of 35 USC 112- first paragraph.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-5, 7-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onischenko (WO 02/079863 A2) in view of McCaughan et al (US 6,545,791 B1).

Onischenko discloses an optical device comprising: a silicon substrate (Fig. 1, page 5, line 19); an insulator formed on the silicon substrate (page 5 line 19); a planar micro-cavity formed on the insulator (Fabry-Perot cavity: page 6 lines 23-25); a first Bragg reflector formed on a first side of the micro-cavity (Fig. 3); a second Bragg reflector formed on a second side of the micro-cavity (Fig. 3); a rib extending through the cavity and Bragg reflectors (Fig. 8-9); a PIN diode formed on the micro-cavity that modulates a refractive index of the cavity (page 10 lines 19-24);

wherein the distributed Bragg reflectors comprise alternating area having high and low refractive indices, wherein the high refractive index sections are formed of Si (silicon), and the low refractive index sections are formed of SiO<sub>2</sub> (silica) (page 5 lines 19-24);

wherein the device further comprising insulative layer formed on the substrate between the substrate and the micro-cavity and Bragg reflectors (83- Fig. 8).

Nevertheless, Onischenko does not explicitly teach the use of electrically isolating lateral trenches on lateral sides of the micro-cavity as claimed. On the other hand, the use of optically isolating lateral trenches (i.e. air trenches) is known in the art, for example, as taught by McCaughan et al. (Figs. 2, 4). McCaughan et al. teach that such trenches are advantageous and

desirable because it increases the efficiency of the optoelectronic device (column 17 lines 48-58). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the device of Onischenko to have lateral trenches as taught by McCaughan.

Claims 6, 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onischenko (WO 02/079863 A2) in view of McCaughan et al (US 6,545,791 B1) as applied to claims above, and further in view of Comfort et al (US 5,308,785).

Onischenko, in view of McCaughan, renders the claimed invention of the present application obvious as discussed above. However, neither Onischenko nor McCaughan explicitly teach the micro-cavity being passivated by thermal oxidation of silicon and the trench being filled with dielectric material such as silicon dioxide.

On the other hand, forming passivation layers by thermal oxidation of silicon and filling the isolation trench with silicon dioxide is known in the art, for example, as taught by Comfort et al. (abstract). Comfort teaches that this feature is advantageous and desirable because it increases the efficiency of the semiconductor device (column 1 lines 17- column 2 line 60). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the device of Onischenko in view of McCaughan and Comfort to have passivation layer via thermal oxidation of silicon and trenches filled with silicon dioxide as claimed in the instant application.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571)272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Sung H. Pak  
Primary Patent Examiner  
Art Unit 2874